

REMARKS/ARGUMENTS

Claims 1-4, 6, 11-13, 15, 17 and 18 are pending herein, claim 1 being independent. Claims 1-4, 11-13, 15, 17 and 18 have been amended. It is believed that these amendments are cosmetic only, and do not alter the scope of the claims.

In the pending Office Action, the Examiner rejected claims 1-4, 6, 13, 15, 17 and 18 under 35 U.S.C. § 103(a) as obvious over United States Patent No. 5,725,376 (Poirier) in view of United States Patent No. 6,118,845 (Simon, *et al.*); claims 4 and 12 under 35 U.S.C. § 103(a) as obvious over Poirier in view of Simon, *et al.* and further in view of United States Patent No. 5,927,982 (Kruger); and claim 11 under 35 U.S.C. § 103(a) over Poirier in view of Simon, *et al.*, and further in view of United States Patent No. 6,488,503 (Lichkus, *et al.*).

Applicants have carefully considered the Examiner's rejections, together with the reasons offered in support thereof, and respectfully disagree with the Examiner's characterizations of the applied art. Applicants therefore submit that the invention as claimed is patentably distinct from the references applied by the Examiner, taken in any combination.

The following description of the invention is taken from the specification and is provided for the Examiner's convenience. It is not intended to argue limitations not present in the claims, or to argue for an interpretation of any claim term that is more narrow than would otherwise be understood by one of ordinary skill in the art based upon a full and fair reading of the application as a whole.

The invention is directed to a method for producing an artifact-corrected image of a negative jaw impression, so that an accurate drilling template may be made of the patient's jaw. The method comprises forming a negative impression of the patient's jaw. Most patients' jaws include non-naturally occurring inserts, such as metal fillings. If a CT scan is taken of a patient's jaw with metal

fillings in it, the metal fillings obscure any portion of the jaw that is located behind the filling. Additionally, the fillings scatter the x-rays or CT rays that impinge thereon so that the image of the jaw in the vicinity of the fillings is not complete and is likely to be distorted. These distortions are referred to as “artifacts” in the instant application (*see, para. [0009]*: “When the recipient mouth contains metal inserts such as tooth fillings, the image produced using CT contains many artifacts that smear and/or distort the true surface boundaries of the recipient jaw.”). The presence of these unavoidable artifacts renders the uncorrected image of the jaw inaccurate.

The invention herein provides a method for correcting the image of the jaw resulting from the presence of artifacts. This is accomplished by taking a digital image of the negative impression. This image is free of artifacts – because there are no metal artifacts in the negative impression -- and provides a base reference for the later comparison. Preferably, the negative impression includes reference markings (claim 4). The inventive method further comprises taking a digital image of the negative impression while the negative impression is in the patient’s mouth. This image includes the artifacts to be corrected. According to the inventive method, the first and second images are compared, and from that comparison, an artifact-corrected image is produced. This image is the desired end result of the process, since it enables the formation of an accurate drilling template with full and accurate knowledge of the actual surfaces of the teeth.

Unless the artifacts are removed (*i.e.*, corrected), the drilling template may be less than perfectly accurate, which leads to problems if it is then used to drill into the patient’s jaw or teeth in the wrong location or at the wrong angle, or if the template is not securely mounted on the teeth (*see, paras. [0015]-[0016]*). The inventive method, therefore, overcomes the deficiencies of the prior art where artifacts were present.

One of the pieces of prior art mentioned in the specification was the Poirier patent (para. [0004]). As described there, Poirier teaches a known technique for making a drilling template based upon a *single* digital image of the teeth, without taking any image of a negative impression.

Poirier describes a method of forming a drilling template in which a *positive* model of a patient's teeth is made (physical model 21, 22). A scanner guide 27 is made "by hand to fit exactly the space occupied by the upper and lower denture" (col. 5, lines 44-45). Scanner guide 27 is thus *also* a *positive* impression of the patient's teeth, which is exactly the opposite of the claimed invention, which requires a *negative* impression of the patient's jaw. Poirier further never discloses a second image, as recognized by the Examiner (p. 3), and so falls short of describing the claimed invention.

The Examiner therefore proposes combining Simon, *et al.* with Poirier to show all of the claimed elements. Simon, *et al.*, however, fail to disclose a method which, even when combined with the teachings of Poirier, would render obvious the invention as claimed.

Simon *et al.* disclose a system and method for reducing and eliminating artifacts in calibrating x-ray imagers. The Examiner has therefore taken the position that Simon, *et al.* teach the missing elements of the invention claimed herein. However, although Simon, *et al.* discuss "artifacts", their usage of that term is quite different from its usage in the instant application. In the claimed invention an "artifact" is a component of the image resulting from fillings, and the like, in a patient's mouth. In other words, an "artifact" results from what is present in the patient's mouth, not from what is introduced into the mouth by the practitioner of the method. In Simon, *et al.*, however, an "artifact" is a portion of the image that results from the markers used to calibrate the x-ray system, and is therefore *not* something already present in the patient. The Simon, *et al.* "artifact" is something having a known value that is added and then eliminated (see, col. 6, lines 51-

64). Such artifacts have a known value which can be eliminated easily (col. 7, lines 5-7: “Essentially, artifact elimination is performed by subtracting a pre-measured offset from each pixel in the marker projections.”). Unlike artifacts in the present invention, the Simon, *et al.* artifacts do not present unknown variables which must be determined *before* they can be eliminated. Thus, the “artifacts” of Simon, *et al.*, present a far different, and much simpler to overcome, obstacle than the “artifacts” addressed by the instant invention, and so the mere mention of removing “artifacts” in Simon, *et al.* does not meet the claim limitation of producing an “artifact-corrected” image (*see, also*, col. 1, lines 64-65: “The calibration markers are rigidly arranged in predetermined patterns in one or more planes in the path of the x-rays. . .”).

Furthermore, Simon, *et al.* do not teach the use of a negative impression of the patient, and comparing the known image of the negative impression with the image taken of the impression in the patient’s mouth to remove *unknown* artifacts from the image and create thereby a more accurate image of the actual jaw of the patient.

In sum, therefore, neither Poirier nor Simon, *et al.* disclose, teach or suggest:

1. forming a negative impression of a patient’s jaw;
2. taking a first image of the negative impression,
3. taking a second image of the negative impression with the patient’s jaw,
4. comparing the two images, or
5. producing a more accurate image of the patient’s jaw, without artifacts of fillings

therein, as a result of the comparison.

Thus, the proposed combination of references applied by the Examiner falls short of teaching *any* of the elements of the claimed invention, let alone all of them.

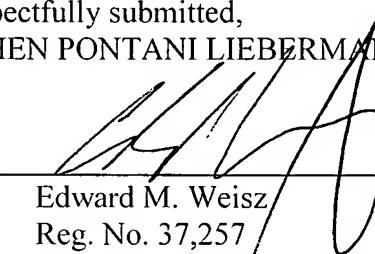
For all these reasons, therefore, the invention as claimed is patentably distinct from the primary combination applied by the Examiner. The addition of the Kruger and/or Lichkus, *et al.* patents overcome none of the deficiencies of the primary combination, and so the invention as claimed distinguishes over the art applied by the Examiner.

For all these reasons, withdrawal of the rejections is respectfully solicited, and early and favorable action is solicited.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
COHEN PONTANI LIEBERMAN & PAVANE LLP

By



Edward M. Weisz
Reg. No. 37,257
551 Fifth Avenue, Suite 1210
New York, New York 10176
(212) 687-2770

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